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SENEGAL TRIES TO HARNESS THE SUN

by Pierre Sormany

At first there is a low whistling noise rising quickly to a crescendo. It is a strange sound in the desert environment of Sine-Saloum Province, some 160 kilometres from Dakar. A group of French and Senegalese engineers wait anxiously around the machine, focal point of a complex network of pipes and tubes.

The whistling soon dies down; something is wrong. "All right, shut it off!" There are resigned scowls. Maybe tomorrow...

The people of the village of Diakhao, a few hundred metres away, have little reason to be concerned about last-minute difficulties at the strange glass-and-metal-pipe plant they have been helping to build for the past two years because the impact of the plant on their lifestyle will be minimal.

Situated in the heart of an arid region where the Serer people are struggling against the encroachment of the desert, Diakhao is not a prosperous village. However, its 2,500 inhabitants do have electricity from a small generator unit providing a maximum current of 30 kilowatts. The generators are diesel-powered, and diesel fuel is expensive in Senegal, a country of extremely limited energy resources whose yearly oil expenditures rose from 10 to 61 billion CFA francs between 1973 and 1981.

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Oil may be scarce in Senegal, but there is plenty of sunlight. Farmers realize this only too well; every year they see the sun dry up their pasture land and endanger their crops. Sunlight, however, is also an energy source.

Unfortunately, the rays of the burning sun are not so easily transformed into electric power. The few engineers working in the machine room of Senegal's first solar power station are now well aware of this fact. Construction began in 1979 and the plant was originally scheduled to open last July. Now it is at least ten months behind schedule.

The project is a joint effort of the French heat and solar energy research corporation (SOFRETES) and its technical partner the Senegalese industrial corporation for the application of solar energy (SINAES). Mr Dufour, the SOFRETES engineer and project foreman, was optimistic, however, when he spoke to a group of journalists from several West African nations who had come for a private tour of the plant. It was inevitable he said, that there should be a few bugs at start-up time.

Diakhao will eventually become the focus of attention for the new solar energy experts who are working on similar projects all over the world. This is the only project in Senegal using solar heat to generate electricity. The objective is to prove that this solar electricity will be economically competitive. Diakhao has the advantage of being a relatively isolated village where it is easy to make comparisons with the use of liquid fuels to generate energy. It is thus an important test for SENELEC - the national electricity company - which paid the 400 million CFA francs needed to build and start up this pilot plant. Diakhao will also and, above all, be an experimental laboratory for SINAES and its French technical partner SOFRETES.

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There are many intermediate stages between the moment the heat of the sun beats down on Diakhao's twelve glass panels (a surface area of 2,048 square metres) and the passing of current through the electric wires which cross the sandy plain to the village. Unlike oil, coal or atomic energy, the sun does not generate enough energy to raise the pressure of water vapour enough to power a turbine.

The solution is to use freon, a gas that evaporates at a low temperature (approximately 25C) and expands considerably once the boiling point of water is reached. Thus, in Diakhao, a first circuit of tubing was laid down to circulate water under the glass panels, where it would reach a temperature of 95-100C, close to the boiling point. Then a second circuit was built, close to the machine, where the freon comes into contact with the hot water pipes, evaporates and acquires sufficient pressure to power a turbine before recondensing to begin the cycle all over again.

The "solar heating chain", as such a machine is called in engineers' jargon, is not the only means of generating electricity from the sun's rays. Silicon crystals (and, to a lesser degree, other semi-conductor metals) can, in what seems like a much more sophisticated fashion, transform light directly into electric power. Unfortunately, the technology is such that sufficient power can be obtained only if silicon is used in perfect crystalline form, and silicon crystals are extremely costly to produce. Until low-cost solar cells are developed, the "heat chain" being tested in Diakhao could provide a necessary interim energy

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source for many nations which are "hostages" of the rise in oil prices.

Until some conclusion is reached at the technical and economic laboratory of Diakhao, the few thousand Serer people who live in the shadow of the water tower which rises above the power plant will at least know that the sun which dries up their land also powers their refrigerators, not only during the day but at night as well, since the experimental plant includes a huge hot water storage tank which enables the solar heating unit to run independently for at least three days.

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